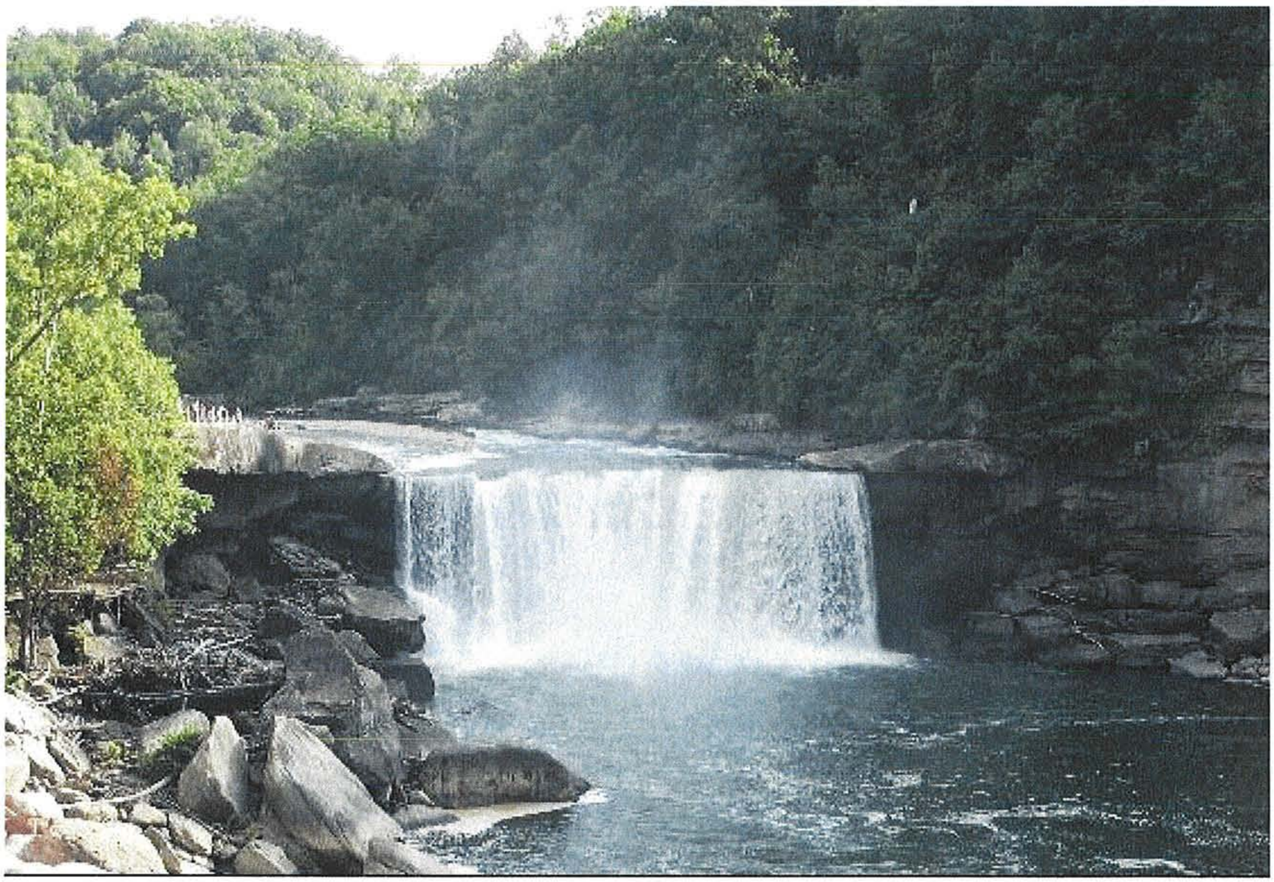
2008 Integrated Report to Congress on Water Quality in Kentucky

Volume 1, 305(b) Report



Kentucky Environmental and
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2008 Integrated Report to Congress on Water Quality in Kentucky

Kentucky Department for Environmental Protection
Kentucky Division of Water
Water Quality Branch
Frankfort, Kentucky

This report has been approved for release:

Sandra Gruzesky, Acting Director
Kentucky Division of Water

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Date

ACKNOWLEDGMENTS

Volume I of this report covers years three and four of the second cycle of the intensive interagency watershed monitoring effort including work from state, federal and local agencies. The Kentucky Department of Fish and Wildlife Resources and their district fisheries biologists have assisted with monitoring and reporting effort by providing data for this report. The U.S. Army Corps of Engineers, Louisville and Nashville districts, contributed to planning, monitoring and data submittal on the reservoirs they manage in the Upper Cumberland – 4-Rivers and Green – Tradewater basin management units. The Kentucky Division of Environmental Services provided analyses of all water quality samples submitted by Division of Water. Appreciation to staff in the following field offices: Bowling Green; London; Madisonville; and Paducah for collecting many of the surface water quality samples and analyzing bacteria samples. U.S. EPA National Health and Environmental effects Research Laboratory in Corvallis, Oregon provided the random monitoring design. Thank you to those who have promoted the watershed effort through Kentucky Division of Water. I would like to thank all the staff in Water Quality and Groundwater and Watershed Management branches of Kentucky Division of Water for their dedication to the efforts of monitoring and assessing the waters of the commonwealth. I am grateful to colleagues who made valuable comments on this report.

Randall G. Payne
Kentucky 305(b) Coordinator
1 April 2008

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Chapter 1. Introduction

The 2008 Integrated Report (IR) was prepared by the Kentucky Division of Water (KDOW), Department for Environmental Protection (DEP), for submittal to the U.S. Environmental Protection Agency (EPA) to fulfill requirements of sections 303(d), 305(b) and 314 of the Federal Water Pollution Control (or Clean Water) Act of 1972 (P.L. 92-500), as subsequently amended. Section 305(b) of the Act requires states to assess and report current water quality conditions to EPA every two years.

In 2006, an Integrated Report (IR) was released for the first time by the commonwealth. It was produced in two volumes, and this procedure is followed for the 2008 IR. Volume 1 reports the 305(b) assessment methods, processes, overview of the commonwealth's water resources, monitoring programs, statistical findings, geo-referencing of monitored and assessed results and a comprehensive table listing all waters or segments assessed, with assessment results, causes (pollutants or pollution) and probable sources. Volume 2 of the IR lists those waters and segments that were not fully supporting one or more designated uses (DU), based on monitored data, and require a TMDL (total maximum daily load) calculation for those pollutants causing the impairments. By integrating the two reports, users of the information in the first IR (2006) found this comprehensive reporting medium of greater utility by having all relevant information together in two volumes. The use of assessment categories to file assessed stream segments and lakes or reservoirs provides an accurate and convenient method for the commonwealth to track the miles (or acres) of assessed and non-assessed uses, while also tracking those impaired waters from the time of 303(d)-listing through the TMDL process and post-implementation.

KDOW utilized the assessment database (ADB) to store use assessments and aid in producing the various tables and compilation of statistics that were presented in this report. The current report was based on assessment data stored in ADB version 2.2; this database had been modified to function per the particular needs of KDOW. As with previous 305(b) reports, ADB provides assessment data of stream segments and geographic data (GNIS [geographic names information system] and latitude - longitude) used to georeference those assessments. This proved to be an efficient mechanism to produce the reach-indexed maps. In addition to the ADB, the TMDL section developed a database based on ADB architecture to track 303(d)-listed water bodies and segments. This database was updated to reflect the TMDL development, approval, and delistings of those waters or segments.

The KDOW initiated a five-year rotating watershed management approach in 1997. Results from the first basin management unit (BMU), the Kentucky River, were reported in the 2000 305(b) report. This IR represents monitoring efforts from the second cycle of the BMU monitoring strategy; thus the 4-Rivers - Upper Cumberland River and Green - Tradewater rivers BMUs were of primary focus in this 2008 IR; these BMUs were monitored beginning in April 2005 – March 2006 and April 2006 – March 2007, respectively. This report also incorporated assessment data and results from monitoring that occurred during this reporting cycle outside of the BMUs of focus; thus providing a statewide update of monitoring results. Data collected by the Ohio River Valley Water Sanitation Commission (ORSANCO) were used to make assessments for the mainstem of the Ohio River (ORSANCO, 2008).

The 303(d)-list contains 6083 miles and approximately 2097 pollutant-waterbody combinations. This monitoring cycle was years three and four of phase two of the second five-year BMU cycle. As such, much of the monitoring activities focused on TMDL-associated watersheds to identify the extent, concentrations and track sources of pollutants of concern necessary for TMDL calculation. To maintain overall awareness of aquatic life support conditions, and compare results from the first cycle phase (2000 and 2001) of these two BMUs, KDOW conducted a second probabilistic designed study of wadeable streams (1^{st} – 5^{th} Strahler order).

There are reasons that some impaired waters were not 303(d)-listed. For example, evaluated data from discharge monitoring reports (DMRs) from permitted facilities were not on the 303(d) list because permit compliance should result in protection of the designated uses; also, these DMR data were not directly monitored instream, but at the outfall.

Chapter 2. Background

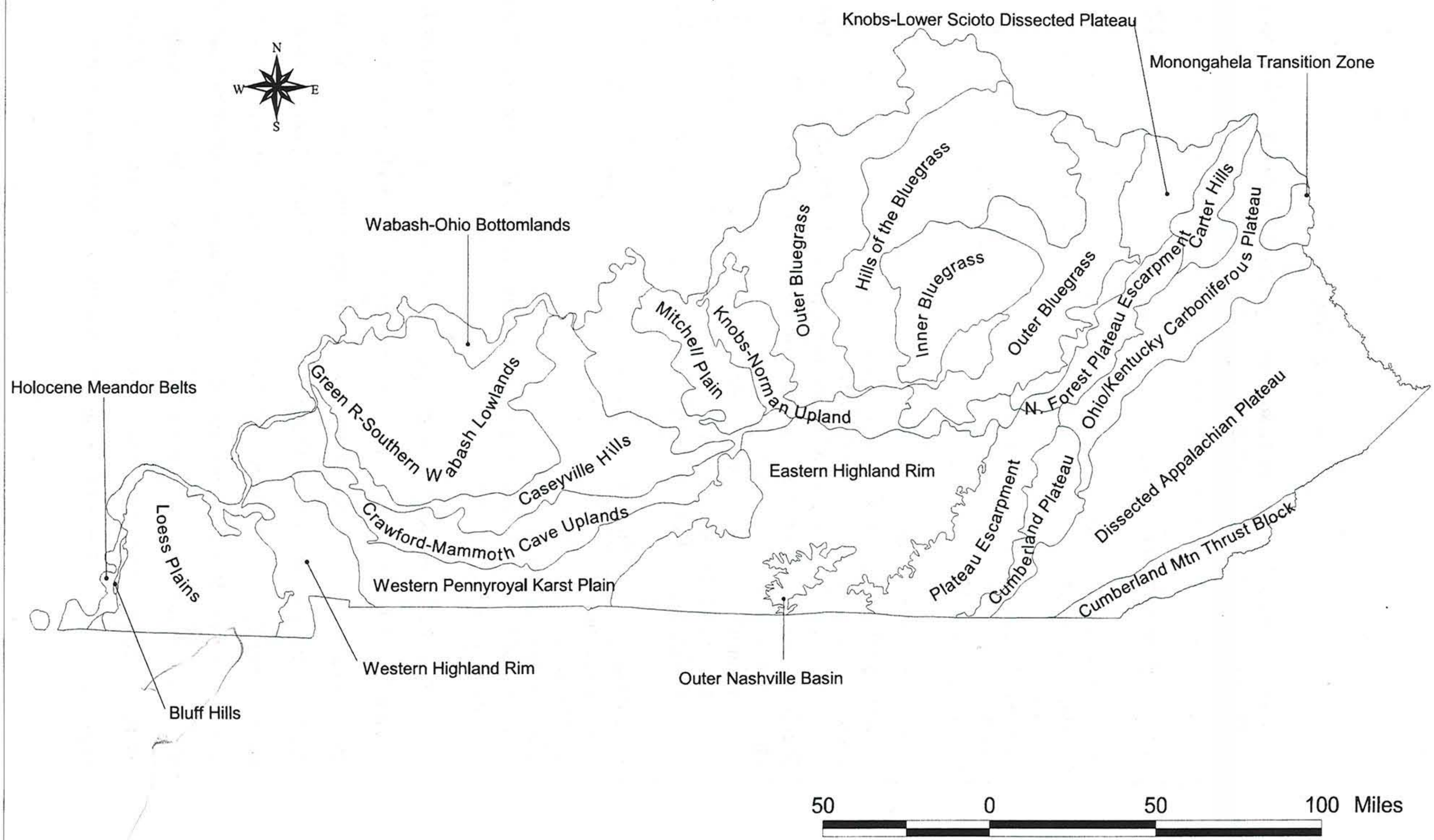
2.1 Atlas of Kentucky's Water Resources and Profile of Select Demographic and Physiographic Statistics Atlas of Kentucky

State population (2006 estimate)[1]	4,206,074
Surface area (square miles)	40,409
Number of counties	120
Number of major physiographic regions	5
Number of level III ecoregions	7
Number of level IV ecoregions	25
Number of major basins	12
Number of USGS 8-digit HUCs[2]	42
Number of stream miles (1:24,000 NHD[3])	90,961
Number of stream-formed border miles (primarily Ohio River)	861
Number of publicly owned lake and reservoir surface acres (estimated)	229,500
Three largest reservoirs by surface acres	
Kentucky Lake (Kentucky portion)	57,103
Cumberland Lake	47,623
Barkley Lake (Kentucky portion)	42,780
Wetland acres (approximation)[4]	324,000

[1]US Census Bureau
[2]Hydrolgic unit code
[3]National hydrography dataset
[4]*The state of Kentucky's environment: 1994 status report.* The Kentucky Environmental Commission, 1995.

The physiography of Kentucky provides a landscape of 25-Level IV Ecoregions (Figure 2.1-1) that are diverse geologically and physically and provide a variety of microclimates that are important in forming and supporting diverse plant and aquatic communities. This rich aquatic biodiversity is a part of the southeastern aquatic environment that provided long, stable conditions, a result of non-glaciations. While the state has many miles of streams and rivers, natural lakes are uncommon and are found along the Lower Ohio and Mississippi rivers in the Jackson Purchase (region west of Tennessee River [Reservoir]); most of these lakes were formed by oxbows or shallow depression basins. Many of the major rivers in the commonwealth have been dammed

Figure 2.1-1. Level IV Ecoregions of Kentucky.



for flood control and secondarily for generation of electricity. This change has altered the natural aquatic communities of these systems while providing drinking water supplies, tourism and recreational opportunities. While only a portion of wetlands exist from what was estimated to have occurred historically (1.5+ million acres), loss of wetland acreage has slowed with federal and state regulations and disincentives for altering wetlands in place (The Kentucky Environmental Commission, 1995). By river basin, the Green River has the largest proportion of remaining wetland acres, approximately 88,000. As indicated by the number of caves in Kentucky, there are significant karst areas in the state, but the largest karst landscape exists in the Green River basin, which includes Mammoth Cave. These areas of karst present special concerns for water quality protection because groundwater flows may be unknown and difficult to monitor due to limited access.

2.2 Programmatic

In order to better characterize the waters of the state and better coordinate resources toward addressing problems, Kentucky adopted a Watershed Management Framework in 1997. The purpose of this management framework is to use programs, people, information, and funds as efficiently as possible to protect, maintain, and restore water and land resources. This approach provides a framework within which participating individuals and institutions can link and support one another's efforts in watershed management.

Coordinated, multi-agency watershed monitoring was initiated in 1998 in the Kentucky River basin, and monitoring for the first five-year watershed cycle was completed in 2002. The first cycle of monitoring focused on obtaining, for the first time, a snapshot of conditions of Kentucky's waters, especially wadeable streams. Most local, state, and federal agencies in Kentucky with monitoring responsibilities cooperated in the watershed monitoring effort. Some agencies simply provided their data and carried out monitoring as usual; others revised their sampling programs and sampling methods for better fit with the watershed monitoring plan. In early 2005, Kentucky Department for Environmental Protection and Tennessee Department of Environment and Conservation formally agreed to begin cooperating and sharing combined resources to work toward making tangible improvement to shared watersheds. For example, several watersheds (Clarks River, Red River and upper Cumberland River) were identified to have interstate concerns and probable shared sources of pollutants or pollution affecting stream health. Monitoring was implemented in 2005 to identify sources and spatial and temporal concentrations of nitrates in the Red River watershed in the lower Cumberland River basin. In addition to scoping and fixing pollutant-source issues, an effort was agreed upon whereby each state identified shared high quality watersheds then, where feasible, establishing them as such in their respective regulations. Additionally, where one state had identified high quality waters crossing state boundary, but the other had not, that state assessed their portion of the stream to determine if it qualified for elevation to high quality designation. An example where an Outstanding National Resource Water (ONRW) had been designated is Reelfoot Lake. Tennessee and Kentucky share this resource (approximately 20 percent in Kentucky), but it has been designated as an ONRW only by Tennessee. Kentucky included this designation (ONRW) for its portion of the resource putting in the 2007-8 triennial review submission.

According to the adopted framework, the state is divided into five BMUs (Figure 2.2-1) for the purposes of focusing management activities spatially and temporally. Activities within each of the five units follow a five-year cycle so efforts can better be focused within a basin. Phases in the cycle include: 1) collecting information about water resources in the basin; 2) identifying priority watersheds; 3) listing the watersheds in the basin in order of priority and deciding which problems can be solved with existing funds; 4) determining how best to solve the problems in the watershed; 5) developing an action plan; and 6) carrying out the strategies in the plan (Figure 2-3). Public participation is also encouraged throughout the process, allowing citizens and organizations to stay informed and have an active role in management of resources. Monitoring and assessment take place in the second and third years, respectively, of the watershed cycle.

Figure 2.2-1. Kentucky Basin Management Units and monitoring years of the second five-year cycle.

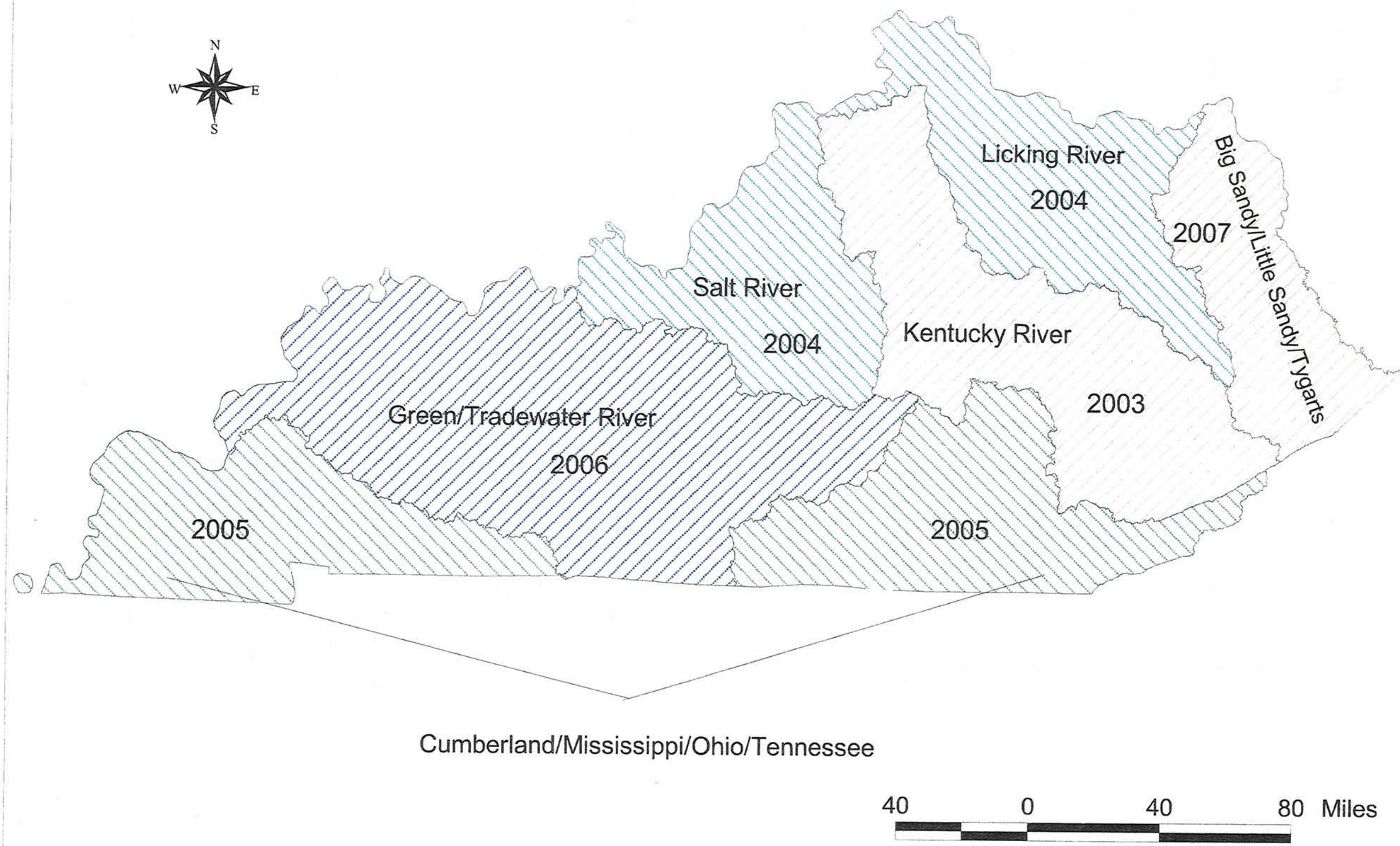
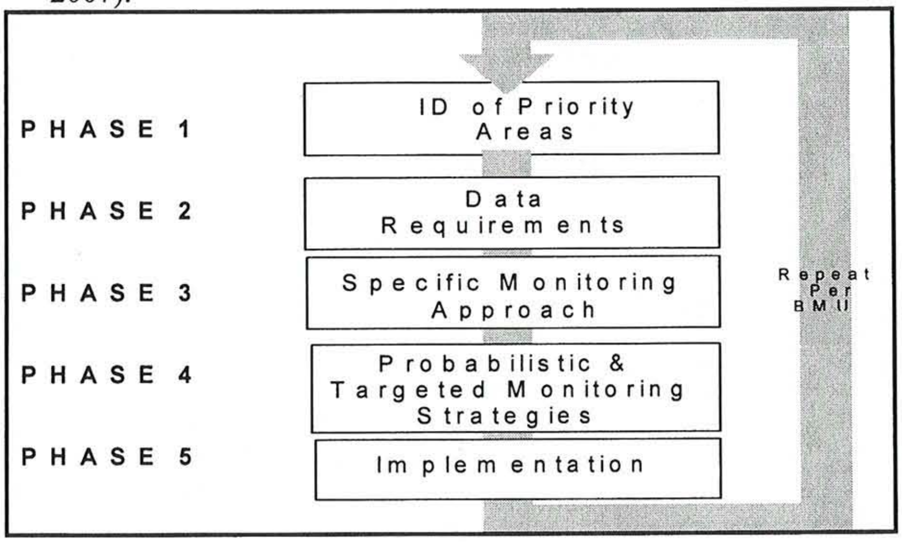


Figure 2.2-2. Phases of the second cycle of the basin management unit approach (2003 – 2007).



Each basin was phased into the second cycle of the Watershed Framework schedule as listed below. Monitoring activities began in April and ended in March the following year.

- April 2003 – March 2004 – Kentucky River basin
- April 2004 – March 2005 – Salt and Licking river basins
- April 2005 – March 2006 – upper Cumberland River and 4-Rivers (lower Cumberland, Ohio, Mississippi and Tennessee rivers) basins
- April 2006 – March 2007 – Green and Tradewater rivers basins
- April 2007 – March 2008 – Big Sandy River, Little Sandy River , and Tygarts Creek basins

Benefits of this approach include:

- Planning and determination of monitoring strategy developed on a watershed approach for TMDL-specific monitoring
- Increased coordination of resource management activities focused on identified priorities in each basin
- Greater ability to stretch limited dollars for implementation activities through partnering and coordination of efforts; spin-off benefit of the initial BMU cycle approach

- Collaboration of state and federal agencies effectively increasing manpower, expertise and environmental disciplines
- More data as monitoring efforts are coordinated – approximately a four-fold increase in assessment data has been realized since the inception of the watershed approach in 1998.
- Better data as agencies standardize methods and procedures.
- Greater opportunities for citizen involvement.

The 2004 305(b) Report represented the completion of the first monitoring and assessment cycle of the five BMU management framework. Whereas the purpose of monitoring in the first watershed cycle was to obtain baseline data statewide, monitoring in the second cycle (begun in 2003) focused on impaired watersheds. However, ambient monitoring continued at long-term stream and lake stations, watersheds not sampled in the first watershed cycle, probabilistic biosurveys, and on small streams to refine reference reach metrics. Much of the work was done sequentially to make best use of monitoring personnel and to collect data during the target index period according to stream sizes. The following is the cycle beginning with planning phase-year with the monitoring and assessment in years two and three, respectively.

- 2002 - 2004 – Kentucky River Basin
- 2003 - 2005 – Salt – Licking basin
- 2004 - 2006 – Upper Cumberland River and 4-Rivers (Lower Cumberland, Mississippi, Ohio, and Tennessee rivers) basin
- 2005 - 2007 – Green – Tradewater rivers basin
- 2006 - 2008 – Big Sandy – Little Sandy rivers and Tygarts Creek basin

2.2.1 Overview of Programs Related to Monitoring and Assessment

The Division of Water has the primary responsibility of monitoring and assessing the commonwealth's water resources, and overseeing the permitting of facilities and industries that discharge point sources to waters through Kentucky Pollutant Discharge Elimination System (KPDES).

To monitor the designated uses of Kentucky's waters and monitor the effectiveness of various control programs, such as KPDES, KDOW has a number of monitoring programs that monitor biological and water quality indicators for 305(b) and 303(d) purposes. Table 2.2.1-1 highlights the monitoring programs and the indicators associated with each. A more comprehensive discussion of surface water quality monitoring programs follows in Chapter 3.

Table 2.2.1-1. Matrix of water resources and monitoring programs

	[a]Long-term Surface Water	[a]Rotating Surface Water	[b,c]Targeted Biological Monitoring	[b]Reference Reach	[d]Probabilistic Biosurvey	[e]Lake Monitoring	[a]Ground-water & Springs Monitor-ing
Streams (1^{st}-5^{th} order)		X	X	X	X		
Large Rivers	X	X	X				
Lakes/Reservoirs						X	
Groundwater							X
Swamps/Wetlands	--	--	--	--	--	--	--

[a]Indicators: physicochemical and pathogen indicator
[b]Indicators: macroinvertebrates, fish, algae, physicochemical, habitat
[c]Includes some 6^{th} order streams where wadeable and associated with ambient water quality stations
[d]Indicators: macroinvertebrates, physicochemical, habitat
[e]Indicators: physicochemical, fish kills, macrophytes, algae

For those waters requiring a Total Maximum Daily Load (TMDL) pollutant reduction, the division's TMDL program manages this process by coordinating the monitoring and development of those discharge or load reductions necessary to bring the impaired Designated Use (DU) into full support. The primary source of pollutants affecting the commonwealth's waters emanate from nonpoint sources (NPS). The fact that sedimentation became the leading pollutant in the 2004 305(b) cycle was a direct reflection on NPS pollution being the more significant source of degradation to the state's waters. This trend follows nationwide.

The primary objectives of the ambient monitoring program were to establish current conditions and long-term records and trends of water quality, biological, fish tissue, and sediment conditions in the state's major watersheds (Kentucky Division of Water, 1986). Sub-objectives were identified as determining: 1) the quality of water in Outstanding Resource Waters; 2) background or baseline water quality conditions in streams not impacted by discharges; 3) the extent to which point and nonpoint sources affect trophic status of lakes and reservoirs; and 4) the impact of acid precipitation on water quality of lakes and reservoirs. There were 70 primary water quality stations throughout the commonwealth that are monitored on a monthly frequency at each station respective of the current monitoring cycle. These stations were located at mid-and lower watershed reaches of 8-digit HUC basins. Location of stations also occurred near the inflow and outflow of major reservoirs, for example Green River Reservoir in the Green River basin. Those stations outside the BMU monitoring phase were monitored bimonthly. Implemented with the rotating basin approach, were the rotating watershed stations. These stations were monitored for the same suite of water quality parameters as the primary stations, but were monitored in smaller watersheds for a variety of reasons. Those primary considerations for candidate watershed monitoring were: 1) TMDL development; 2) characterize water quality in reference watersheds; 3) monitor waters that receive permitted discharge (for instance a municipal wastewater treatment plant) to characterize upstream and downstream water quality; and 4) characterize water quality conditions in certain landscapes, such as agricultural or mining areas.

KDOW's targeted biological monitoring program has a long history associated in determining the health and long-term water quality of stream and river resources. In addition to biological community survey, water quality variables were included in the monitoring program. Biological monitoring was implemented in the 1970s with significant refinement of the program as more research led to the development of biological multimetric indices (for more information go to Methods for Assessing Biological Integrity Of Surface Waters in Kentucky). A portion of KDOW's biological monitoring emphasis was shifted to development of those metrics and associated criteria through a reference reach approach. This was implemented in the 1990s based on an ecoregional approach to determine reference conditions in each basin. These waters do not represent pristine conditions rather they represent the best examples of high water quality and biological integrity in each of the four identified bioregions. Through this effort a network of streams, or stream reaches, have been identified throughout the commonwealth. These stream reaches were listed in water quality standards, 401 KAR 5:030 and can be accessed at: http://www.lrc.ky.gov/kar/401/005/030.htm. One to three biological communities (macroinvertebrates, fishes, or algae) were sampled per biosurvey. When one community only was used to make an aquatic life use support determination, either macroinvertebrates or fishes were monitored, typically the former.

A random biosurvey effort was initiated with the help of EPA's technical support group in Corvallis, Oregon. Kentucky's approach was to sample macroinvertebrates once at a minimum of 50 sites in each BMU. In 2004 nutrients and additional chemical water quality variables were added to the suite of indicators used by this program. These additional data were added to aid in the development of numeric nutrient criteria, gain a more comprehensive knowledge of what ambient water quality variable values were in each BMU, and increase the confidence of each aquatic life use assessment. This program allows KDOW to report on aquatic life use support in wadeable streams for the entire state over the five year watershed cycle. Section 305(b) use support determinations made through the probabilistic biosurvy program were determined only on segments directly monitored, whereas extrapolated use support over a given BMU was made for informational, resource conditions, and planning purposes only. This program was important both on the statewide level as well as national level, as indicated by EPA's nationwide probabilistic monitoring efforts in wadeable streams, lakes and reservoirs and a planned large rivers survey in mid-2008.

Lake and reservoir monitoring program began in the early 1980s as part of the Clean Lakes monitoring initiative. Currently KDOW monitors all significant publicly-owned lakes and reservoirs in the state (approximately 105 waterbodies). Many of the Corps of Engineers (COE) reservoirs and Kentucky Lake, a Tennessee Valley Authority (TVA) project, were typically monitored by those respective agencies per our protocol and collaborative efforts. The working relationship between KDOW and COE, Louisville and Nashville Districts, has proved to be a good cooperative effort that is beneficial to all parties by increasing available resources (e.g. COE may provide the field work and KDOW, in coordination with Division of Environmental Services (DES) provides chemical analyses).

Physicochemical and chlorophyll *a* were analyzed to determine current Trophic State status of these waterbodies. Monitoring occurs three times during the growing season (spring, summer and fall) to capture the seasonal variability that occurs and reflects the trophic state of the resource. By monitoring these resources every five years, trends in water quality can be measured. This monitoring program collects data sufficient to determine aquatic life, secondary contact recreation and drinking water supply DUs. The majority of these resources are posted by Kentucky Fish and Wildlife Department as "no swimming" water bodies, precluding applicability of primary contact recreation monitoring.

2.3 Costs Associated with Water Pollution

Putting a dollar figure on the costs associated with water pollution is difficult to determine. However, the costs associated with KPDES-permitted facilities, which are primarily comprised of industrial facilities, package wastewater treatment plants, and municipal wastewater treatment plants, are in the tens of millions of dollars considering construction, operating, maintenance, compliance, and administrative costs. Figures obtained from KDOW, Facilities Construction Branch, give some insight into the costs associated with treating household, business and industrial wastes.

Table 2.3-1. Costs to taxpayers for municipal waste water treatment facilities (planning, design and construction) for the control of pollution from houses, businesses and industries.

	Clean Water State Revolving Fund	EPA Special Appropriation Grants
FFY 2005	38,722,975	7,216,800
FFY 2006	20,282,027	5,925,400
Prior to FFY 2005	400,653,831 (first loan made in May 1989)	38,154,802 (first grant awarded in 1998)
Total	$459,658,833	$51,297,002

However, these costs are only a portion of the total costs to society. The increased cost of technology needed to treat potable water in areas of heavy siltation/sedimentation alone may result in loss of source water supply because the cost of treatment is prohibitive, while areas of organic industrial contamination may require expensive continuous carbon-based treatment. Medical and loss of productivity costs associated with various diseases that may result from waterborne pollution are not accurately known. For example, consumption of fish flesh that has elevated levels of mercury carries increased health risks that may be at a level to restrict consumption by children and women of childbearing age, while fish contaminated with elevated levels of PCBs carries increased cancer risks to the general population. Pollutants affect commercial fisheries where restricted consumption, or loss of resources, reduces the commercially available fish population; additionally, some members of society rely on subsistence fishing to supply a portion of their nutritional needs. Water pollution may also result in loss of revenue to governments and local businesses if recreation areas are unsafe for swimming or fishing. The shipping industry relies on barges to move many commodities around the nation, and the cost of maintaining shipping channels prone to fill due to excess sedimentation is an ongoing expense to both industries and governments.

2.4 Monitoring and Assessment Issues Facing the Commonwealth

Some of the larger monitoring and assessment issues are presented below. However, the overriding issue is personnel to conduct additional monitoring tasks and use these generated data in a meaningful way throughout the various water management programs.

KDOW submitted a nutrient criteria development plan in 2004 that was satisfactory to EPA. The first waters scheduled for criteria development are wadeable streams and intrastate reservoirs. A particular need is for data from the inner bluegrass (ecoregion 71l). Watersheds reflecting reference conditions are difficult to locate in this region due to the intensive land uses largely by agriculture as well as development or urbanization. This particular area has high phosphate content found in the Lexington limestone layers of the plateau that, with the addition of significant inputs of nitrogen associated with intensive livestock grazing, grasslands, and urbanization and suburbanization, has resulted in nutrient-rich streams and reservoirs. The division has begun addressing this issue through applying a 1 mg/L total phosphorus discharge limit to those waters impaired by nutrient enrichment, and increased nutrient sampling; however, greater frequency is needed to capture seasonal variations and effects on stream systems. Given the karst geology of much of the inner bluegrass, many of these streams are connected and have watersheds that are yet to be mapped and understood. To obtain necessary additional nutrient-data KDOW has secured EPA funds to involve Western Kentucky University and USGS to monitor two Level IV ecorgions in this area (71a and 71e). Continuance of data collection and development of criteria based on the best attainable conditions will dictate those numbers in this region. Additional data are required from the mountainous region of the commonwealth for numeric nutrient criteria development. A 106 supplemental grant was awarded to Kentucky Geological Survey (KGS) to assist KDOW in physicochemical data collection in wadeable watersheds in this region that receive discharge from municipal, package and household wastewater treatment facilities or units. Part of the study design was to identify those receiving watersheds that have minimal other potential impacts, particularly from mining activities. This project was scheduled to begin in spring 2008 and run approximately one year. Biologic communities (macroinvertebrates and algae) will be collected from each station once during the appropriate biological index period. Correlation of nutrient data to community structure was the objective. It should be noted the KDOW had considerable data throughout this region; however, either nutrient data were not collected with biological data or it was collected from naturally nutrient-poor reference watersheds. This region is made up of the following river basins: upper Cumberland; upper Kentucky; Big Sandy; Little Sandy; and upper Licking.

Lake and reservoir data were relatively complete and span approximately 25 years. This program continued to characterize the trophic state of these waters during the growing season; samples were collected spring, summer, and fall. The majority of reservoirs had remained stable according to TSI, but there were trends from oligotrophic to mesotrophic occurring in some waters.

Kentucky's wetlands were primarily bottomland hardwood systems that flood seasonally. This corresponds to the winter and spring rainy season. Any excess nutrients will likely have a subtle impact on these environments since the supply of water comes from flooding rivers, and seasonal inundation. These bottomland hardwoods naturally do not hold standing surface water for a prolonged period of the year.

To date, there have been no recognizable geographic patterns in mercury levels in fish tissue. A potential strategy to aid in detecting a possible pattern may be moving toward a random monitoring scheme. Constraints may be put on the habitat population of interest, such as 4^{th} and 5^{th} order wadeable streams, major streams (>5^{th} order), etc.

States are now faced with the situation where they are asked to maintain a robust ambient monitoring program to characterize and track conditions of the state's waters (305b reporting) and at the same time collect data for TMDL development in hundreds of impaired waterbodies and segments, eventually tracking the success of implementation. Faced with these tasks, the most critical resource need at this time is additional support for the TMDL program, as much of the monitoring resources have been shifted from ambient programs into the TMDL monitoring-specific needs. Like most states, Kentucky's schedule requires hundreds (approximately 1700) of TMDLs be developed over the next decade. More staff, lab resources, and especially contractual monies, must be obtained to accomplish this workload without continued loss of ambient monitoring resources, either through additional EPA or state funding. KDOW must establish arrangements to fund TMDL planning, data collection, lab analysis, and development with internal, contractual, and interested third-party resources, including volunteer organizations.

Industrial and point source monitoring is important to the commonwealth's assessment of the effectiveness of permitted facilities adhering to their permit limits, and if the permitted limits are appropriate and protective for the receiving waters. The primary target of this monitoring program would be to gage the biological integrity in these waters. This monitoring need may only be fulfilled with significant monetary and personnel resources; however, neither of these resources will likely become sufficient within this decade. Contracting the work through a federal grant would be one way to address this need.

This permit biomonitoring program would help fulfill sections 301, 302, 303, 305, 306, 307, 308, 314 and 402 of the CWA. Milestones would be incremental, with resources initially directed to pre-permit biomonitoring. As resources increase biomonitoring would be implemented prior to application renewals. The earliest implementation would be 2014 and, given the resources needed to undertake this objective, it is currently not viewed as realistic in this timeframe.